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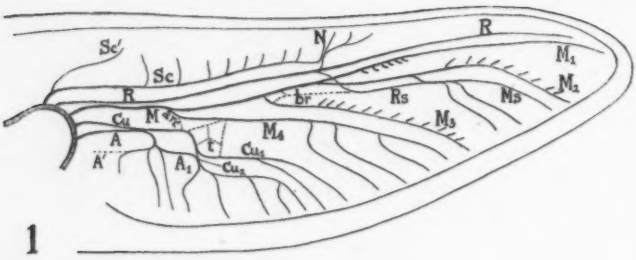

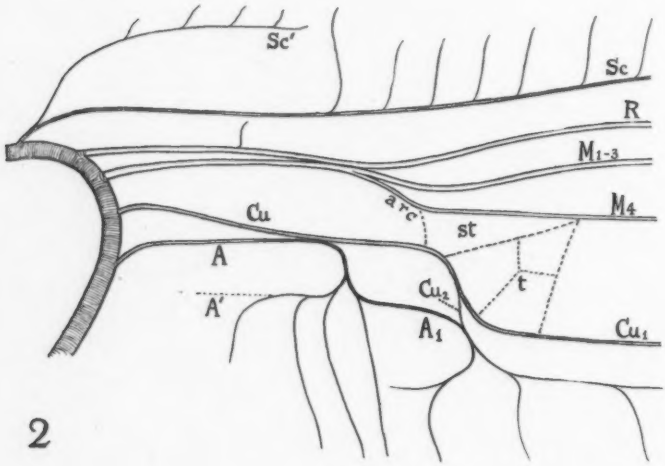

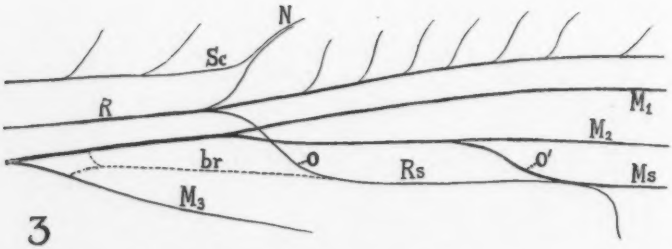

LARVAL TRACHEATION OF UROPETALA CHILTONI.—TILLYARD.

ENTOMOLOGICAL NEWS

AND

PROCEEDINGS OF THE ENTOMOLOGICAL SECTION

THE ACADEMY OF NATURAL SCIENCES, PHILADELPHIA

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New Researches upon the Problem of the Wing-Venation of Odonata.

I. A Study of the Tracheation of the Larval Wings in the Genus Uropetala from New Zealand

By R. J. TILLYARD, M.A., Sc.D. (Cantab.), D.Sc. (Sydney), F.L.S., F.E.S., Entomologist and Chief of the Biological Department, Cawthron Institute, Nelson, New Zealand.

(With Plate I and three text figures)

In the Suborder Anisoptera the most archaic family still existing is probably the *Petaluridae,* containing only five genera, having a discontinuous palaeogenic distribution. These are: *Tachopteryx* in North America, *Tanypteryx* in North America and Japan, *Phenes* in South America, *Uropetala* in New Zealand, and *Petalura* in Australia. They are all dragonflies of large size; the greatest number of species in any one genus is three in *Petalura; Tanypteryx* and *Uropetala* have two species each, while *Tachopteryx* and *Phenes* are monotypic.

The family is characterized, amongst other things, by the presence of *two oblique veins* lying distad from the nodus, between *M2* and the next longitudinal vein below it. This

latter vein is called by Needham and others *Rs.*[1] While accepting, in the past, this terminology, as far as the Anisoptera are concerned, I have pointed out that, in the Suborder Zygoptera, the trachea supplying this vein is a branch of *M*, and never has any connection with *R* at all. Hence I have claimed that the corresponding vein in the Zygoptera cannot rightly be called *Rs*, and I have suggested the name "Zygopterid Sector" for it, with the notation *Ms.*[2]

The full account of Needham's Theory of the crossing of *Rs* over two branches of *M*, viz. *M*1 and *M*2, is by now so well known to all Odonatologists that I shall save space by not recapitulating it here, and shall only refer my readers to Needham's very clear account of it (1). The chief point of importance to be noted is the claim that the oblique vein, of which there is only one present in most Anisoptera, represents the original position of crossing of *Rs* below *M*2, while all that part of the main vein lying below it basad from the oblique vein is a new formation, not represented in the original Odonate type, and designed to strengthen the wing for flight. This part is called by Needham the *bridge-vein*. In the larval wing the bridge-vein is formed by a pigment-band only, without any precedent tracheation, and it is this fact, more than any other, which has influenced Needham in forming his conclusions.

No satisfactory explanation has ever been offered of the condition of things in the *Petaluridae*, where two oblique veins are always present. For many years I have endeavored to find suitable stages of the larvae of *Petalura*, from which to solve this problem; but the search has been unsuccessful, owing to the draining and cutting up of the swamps on the Blue Mountains in which I originally found this larva.

In November, 1919, I visited New Zealand, where I stayed five months. While at Wellington at the beginning of De-

[1] Needham, J. G. "A genealogic study of Dragonfly Wing Venation." Proc. U. S. Nat. Mus., Washington, No. 1331, 1903, xxvi, pp. 703-761, 24 pl. (See especially Figs. 1-2, pp. 706-7, and 710-714.)

[2] Tillyard, R. J. "On the Development of the Wing-Venation in Zygopterous Dragonflies, with special reference to the *Calopterygidae*." Proc. Linn. Soc. N. S. W., 1915, xl, pt. 2, pp. 212-230. (See p. 224 and plates.)

cember, Mr. H. Hamilton, Zoologist, Dominion Museum, showed me a live specimen of the larva of *Uropetala carovei* White, sent in by Mr. Wilson of Bull's. This larva was handed over to me for study, and I dissected it and studied its wing-tracheation while staying at Mr. Hamilton's home at Karori. For his kindness and assistance in this matter I desire to thank Mr. Hamilton very much.

In January, 1920, I was the guest of Professor and Mrs. Chilton at Christchurch, and spent three days visiting the Cass Biological Station, in company with Professor Chilton and Mr. Chas. Lindsay, of the Canterbury Museum. During the first day's collecting, we located a large number of larval burrows of *Uropetala* in a small mountain swamp about two miles from the Station. The species to which these larvae belonged proved, on careful study, to be new, and has been described by me as *U. chiltoni*. The larva is not so fierce as that of *U. carovei*, and more resembles the larva of *Petalura*. It can be easily obtained by inserting one's fingers into the burrows, and working down to a depth of from ten to eighteen inches, when the larva will be felt as a hard object against the soft walls of the tunnel, and can easily be seized and drawn out. More than fifty of the larvae of *U. chiltoni* were thus obtained, and were brought back to the Station alive for study.

I wish here to thank Professor Chilton for his great kindness in allowing me the use of the Cass Biological Station, and in placing himself at my disposal during my short but fruitful visit there, and Mr. Lindsay for his help in the field.

The larvae, when examined, proved to belong to the last three instars. A number of dissections of both fore and hind wings were made. It was found that there was very little difference in the arrangement of the tracheae in the various instars, and the results also agreed entirely with those obtained from the study of the larva of *U. carovei* from Bull's, which was in the last instar.

In Plate I, fig. 1, I have shown the general scheme of tracheation for the hind wing in the penultimate instar. Points of interest to be noted are the following:—

(1) The presence of a strong basal branch of *Sc*, which I have labeled *Sc'*. This would seem to be the homologue of the similar branch found in Plectoptera, from which the strong ***humeral vein*** of that Order is developed. Probably also a similar trachea originally underlay the anterior branch of *Sc* in the fossil Orders Paratrichoptera and Protomecoptera, both of Triassic age.

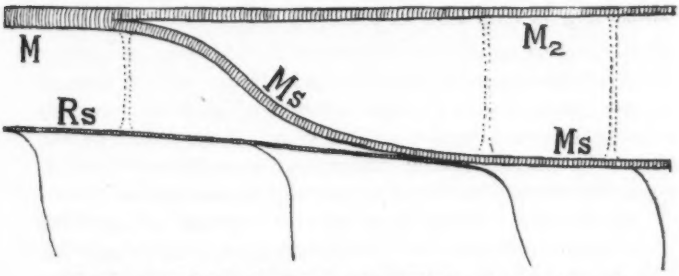
(2) The anal trachea, which is clearly the homologue of 1*A* in those insects in which more than one such vein is present, arises well below *Cu*, converges towards it, and finally touches it. It then bends away at the *anal crossing*, reaching again the level of the *anal vein* of the imago (*A'*), of which the basal portion is formed, like the bridge-vein, by a pigment-band only, without precedent tracheation. The main stem of trachea *A* passes on distad to a point just below the downward bend of *Cu*1, where it meets for a short distance with a very weakly formed trachea from *Cu*1, and then bends sharply away from it again towards the base of the wing posteriorly. We have been in the habit of calling this weak trachea *Cu2*. The formation seen in *Uropetala* strongly suggests, to my mind, that this supposed trachea *Cu2* is in reality not the original *Cu2* at all, but a new tracheal formation, which has succeeded in cutting off the distal portion of 1*A*, leaving only the turned back portions still attached to the anal trachea. If this is the true interpretation of these parts, it would follow that *Cu* in the Odonata must have been originally a simple trachea and vein. I shall show, in a later part of these researches, that *Cu* was such a vein in the Protodonata, and that all stages in the capture of the distal portion of 1*A* by a new branch descending from *Cu* are to be seen in the record of the Liassic Odonata.

Plate I, fig. 2, shows the base of the hind wing enlarged, to illustrate the characters described under (1) and (2) more forcibly.

(3) Turning next to the very important problem of the Radial and Zygopterid Sectors, Plate I, fig. 3, shows, greatly enlarged, the condition of the tracheation of *Uropetala* in the region of the two oblique veins for the *antepenultimate* instar, which was the earliest stage obtainable at Cass in January. The oblique vein *O*, it will be seen, is preceded by a very weak tracheal formation arising from *R* below the nodus, crossing *M*1 and *M*2 just distad of their origin from *M*1+2, and continuing beyond *O*, for only a moderate distance, along the line of the imaginal vein called by Needham *Rs*. It is clearly this formation which corresponds with the single oblique vein of other Anisoptera. Basad from *O*, the line of *Rs* is continued backwards by a pigment band only, without any tracheation. This band is connected more strongly with *M*3 than with *M*1+2, its connection with the latter appearing to be more in the nature of a cross-vein at this stage. It is this band which forms the ***bridge-vein*** of the Anisoptera in the imaginal stage.

Well beyond *O*, there is a second oblique *O'*. From Plate I, fig. 3, it will be seen that this is preceded, in the larval tracheation, by a very

strong branch descending from *M2*, and then continuing the line of *Rs* distad. If we compare this formation with that found in the larvae of the Zygopterid family *Lestidae*, we shall see plainly enough that *O'* is the homologue of the oblique trachea in that family, and that the *long bridge* of the *Lestidae* is *not* the homologue of the *bridge* of Anisoptera, but comprises all that part lying basad from *O'*, along the line of the so-called *Rs*. To the trachea which arises from *M* to form *O'* I have already given the notation *Ms*, as well as to the vein that forms along it in the imago, so that we may now continue to apply this notation in the case of *Uropetala*.



Text fig. 1.—*Uropetala chiltoni* Till., antepenultimate instar, forewing, region of distal oblique vein, more highly magnified. (x 104.)

In text-fig. 1 I have shown, very greatly enlarged, the condition of the tracheation at the antepenultimate instar in the region of the origin of *Ms*. The difference in calibre between *Ms* and *Rs* is exceedingly marked. In the penultimate instar the calibre of *Rs* increases, while in the last instar the calibres of *Rs* and *Ms* are approximately the same, though *Ms* is usually still slightly the larger. In no case does *Rs* proceed beyond the position of the first descending cross-vein after *O'*; all the rest of the so-called *Rs* of Needham, together with the descending cross-veins and that portion of the *radial supplement* which carries tracheae is supplied entirely from trachea *Ms*.

We thus see that in *Uropetala* larvae, the single longitudinal imaginal vein *Rs* of Needham is formed from three distinct parts as follows:—

(a) A basal portion, arising from *M3* near its origin, having no precedent tracheation, and representing the *bridge-vein* of Needham in the Anisoptera.

(b) A middle portion, lying between *O* and *O'*, which is preceded by a trachea arising from *R* below the nodus, crossing *M1* and *M2*, running along *O*, underlying *Rs* between *O* and *O'*, then touching *Ms* and finally turning off to supply the first cross-vein beyond *O'*. This portion plus (a) represents the *long bridge* in the *Lestidae*.

(c) A distal portion, from *O'* onward, supplied by a true branch of *M*, viz., *Ms*, whose basal piece underlies *O'*. This portion is about as long, in *Uropetala*, as the other two portions combined.

Having completed this somewhat complicated analysis of the tracheation of this region, we may now proceed to solve the vexed question of the true homologies of the parts in question. Are we dealing with a single longitudinal vein of complex origin, whose evolution is to be traced out by reference to the courses of the larval tracheae underlying it; or are we not rather dealing with a single primitive longitudinal vein, whose larval tracheal supply has become more and more specialized during the evolution of the Odonata? If the former, then we cannot hope to find any simple notation which would correctly express the true structure of this vein. If the latter, we can ignore the tracheal specializations, and name the vein according to its true position as a simple longitudinal vein.

This problem is really quite easy of solution. For, if the vein called by Needham *Rs* is really complex, then we may expect to find, in the fossil record, some types at least in which the formation of the bridge-vein is not completed. But a careful study of the fossils shows that, both in the Protodonata and in all the Liassic Odonata, *this supposed Rs is a single complete vein, which arises from M3 near its origin, and runs parallel to and below M2, without any connection whatever with R.* In *Typus* and some Liassic fossils, such as *Heterophlebia*, an oblique vein is present in the position of *O'*, thus showing a tracheational connection with *M2*. But, in all the rest of the Protodonata, and in most of the Liassic Odonata, even this is absent, and we find the same simple condition that is still to be seen in all the Zygoptera except the *Lestidae*, viz., that the supposed *Rs* of Needham is in reality a true branch of *M*, with no oblique veins above, and with absolutely no connection with R. This is, then, surely the primitive condition of this vein in the Odonata; and the specializations which have set in during the evolution of the Order are surely tracheational specializations only, which do not demonstrate to us the course of evolution of the vein, but rather serve to mask its simple origin, by the complexity of the changes that have taken place in the tracheal supply.

While admitting that, in most cases, the precedent larval tracheation may be profitably studied for the purpose of determining the homologies of the imaginal veins, it should be evident to everybody that larval wing-tracheation may be just as much subject to change, along its own evolutionary line, as is the imaginal wing-venation, or any other structure. In his work on the Odonata, Needham seems to have worked along the lines of assuming that, *in all cases*, the tracheation was to be relied upon to show absolutely the line of evolution of the venation. It is another instance of an attempt, of which there have been many, to apply Haeckel's Biogenetic Law in its entirety, without taking into account the possibility of larval structures, such as the wing-tracheation, undergoing lines of evolution of their own, so that they, in certain cases, may become far more highly specialized than the corresponding imaginal structures. It is certainly possible to prove, from the fossil record, that Needham's supposed bridge-vein was never formed backwards as a bridge-vein, but was always the basal portion of a strongly formed main longitudinal vein arising from *M*3 (or sometimes *M*1+2, as in most recent forms) close to the point of separation of these veins. This proof I propose to give in another part of these researches, which will deal entirely with fossil forms. Meanwhile, for the further elucidation of the problem, I now propose to denote *this entire vein* by the notation *Ms*, as I have previously done for the Zygoptera. Logically, if we admit five branches of *M*, they should be called *M*1, *M*2, *M*3, *M*4 and *M*5, respectively, instead of *M*1, *M*2, *Ms*, *M*3 and *M*4, as at present; this I have already pointed out in a previous paper.[3] But, as a matter of fact, we have not come down to the true solution of the whole problem yet, and so I propose to let the notation *Ms* stand, seeing that it is at any rate now proved that this vein was originally a true branch of *M*.

(To be continued)

EXPLANATION OF PLATE I.

Fig. 1. *Uropetala chiltoni* Till., penultimate larval instar, tracheation of hindwing. (x 13.)

Fig. 2. *Uropetala chiltoni* Till., penultimate larval instar, basal third of hindwing more highly magnified, to show tracheation. (x 45.)

Fig. 3. *Uropetala chiltoni* Till., antepenultimate instar, forewing, region of nodus and oblique veins. (x 38.)

[3] Tillyard, R. J. "The Panorpoid Complex. Part 3: The Wing-Venation." Proc. Linn. Soc. N. S. W., 1919, xliv, pt. 3. pp. 533-718. (See pp. 555-9 and text-fig. 41.)

Chironomus braseniae, New Species (Dip., Chironomidae).

By ADELBERT L. LEATHERS, Agricultural College, North Dakota.

Chironomus braseniae n. sp.

♂. Head, proboscis, palpi and basal joint of antennae yellow, eyes black, antennal shaft and verticils brown. Antennae with 14 joints, the terminal joint two-thirds as long as the rest of the antenna.

Pronotum projecting laterally but not reaching the level of the mesonotum dorsally. Mesonotum greenish yellow, translucent and somewhat pruinose; vittae of a light buff color. Scutellum and halteres yellow; metanotum and sternopleura buff color. Wings white, longitudinal veins and cross veins not infuscated. Cubitus forking distinctly beyond the cross vein; the third and fourth longitudinal veins ending about equally distant from the apex of the wing. Legs whitish, fore tarsus not bearded, middle and hind tarsi densly bearded for their entire length. Tibial comb darkened on all legs; basal segment of fore tarsi more than one-half longer than the tibia, proportions as 47:30. Pulvilli well developed, empodium narrow.

Abdomen light green densely clothed with long yellow hairs. Segments without distinct fasciae.

♀. Antennae yellow, apical joint slightly infuscated. Posterior margins of the abdominal segments with a narrow whitish fascia. Otherwise like the male. Length 3.5 to 4 mm.

The *type* specimen is a male which was bred from a larva inhabiting the leaves of *Brasenia peltata*. The specimen was obtained from Spencer Lake near the village of North Spencer, New York, in July, 1915, and may be found in the collection of the New York State College of Agriculture, Ithaca, New York. The publication of this species at this time is due to the recommendation of Prof. O. A. Johannsen, under whom I did my minor work while at Cornell, 1915-1916.

The larva has the unique habit of cutting grooves in the foliage of a variety of aquatic plants, which have floating leaves. The specific name is the same as the generic name of the plant which the female seemed to favor. A more complete discussion of the ecology of this species will be found in a paper now in the hands of the Bureau of Fisheries, which should soon be available to the public, under the title of "An Ecological Study of the Chironomidae with Special Reference to Their Feeding Habits."

New Synonyms in the Noctuidae (Lep.).

By Wm. Barnes, M.D., and A. W. Lindsey, Ph.D.,
Decatur, Illinois.

The recent appearance in the *Insecutor Inscitiae Menstruus* of two articles by Dr. H. G. Dyar, describing new species of Lepidoptera, has led us to make a careful examination of our series standing as *Calophasia strigata* Smith and *Cerapoda oblita* Grote. We find that *strigata* has the front tarsi armed with curved, claw-like spines, though they are relatively a little smaller than those found in *oblita*. The species should therefore be removed to *Cerapoda*. We believe that *Calophasia* will drop from the North American fauna.

We regret to say that we must disagree with the synonymy proposed by Dr. Dyar for these species (Ins. Ins. Menst. ix, 63). The type of *oblita* is in the British Museum, and was figured by Sir George F. Hampson (Cat. Lep. Phal. B. M. vi, 181). Dr. McDunnough examined the type in person some years ago, and we have in our possession a specimen compared by him. This specimen was figured in the *Contributions* vol. ii, no. 1, pl. v, fig. 4. Our identification of *strigata* is also based on a specimen compared with the type, which is in the National Museum.

While the marks of *strigata* and *oblita* are similar, the former species is smaller, its primaries darker and more evenly gray, and the reniform entirely lacks the heavy white mark which characterizes *oblita*. The fact that Dr. Dyar has access to the type of *strigata* leads us to believe that it is this gray species which he treats as *oblita-strigata*. His description of *arrosta* bears this out, for this description, as well as fig. 17, pl. xx of Holland's *Moth Book*, comes well within the range of variation exhibited by our series of *oblita*. It seems that these species should stand as follows:

Genus Cerapoda Smith.

1. oblita Grote. 1877, Bull. Geog. Surv. Terr. Iii. 117. *Oncocnemis.* 1906, Hampson, Cat. Lep. Phal. B. M. vi, 181. *Cerapoda.* 1913, Barnes & McDunnough, Cont. Nat. Hist. Lep. N. A. ii (i), 12, pl. v, figs. 3, 4. *Cerapoda* (*Oncocnemis*).

†*strigata* Holland (not Smith). 1903, Moth Book 170, pl. xx, fig. 17. *Calophasia.*

deserta Grinnell. 1912, Bull. S. Cal. Acad. Sci. xi, 79. *Autographa.*
arrosta Dyar. 1921, Ins. Ins. Menst. ix, 63. *Cerapoda.*
2. STRIGATA Smith. 1891, Trans. Am. Ent. Soc. xviii, 107. *Calophasia.*
1906, Hampson, Cat. Lep. Phal. B. M. vi, 125. ?*Calophasia.*
1917, Barnes & McDunnough, Check List No. 2012, p. 56. *Calophasia.*
†*oblita* Dyar (not Grote). 1921, Ins. Ins. Menst. ix, 63. *Cerapoda.*

Another synonym appears in Dr. Dyar's *Schinia melliflua.* This name applies to *Schinia niveicosta* Smith. *Niveicosta* was described from a single female, rather duller than most examples, which is in our possession. We have also a small series from Palm Springs, California, the type locality of *melliflua.* The species is very variable, but is unlike any other known to us and is very well characterized by Dyar's description of *melliflua.*

An Undescribed Species of Net-winged Midge from Argentina (Blepharoceridae, Diptera.)

By CHARLES P. ALEXANDER, Urbana, Illinois.

In 1920 (Arkiv för Zoologi, Band 13, No. 7, pp. 1-4), the writer described a new genus and species of net-winged midge, *Edwardsina chilensis,* from southern Chile. As indicated in the original description, the fly exhibits some very unusual venational features. The discovery of a second species of this primitive genus of Blepharoceridae is of more than usual interest. The two specimens upon which the following description is based were collected by Dr. Carette along the Rio Diamante in southern Mendoza, Argentina, and kindly sent to me for determination by my friend, Dr. Charles Bruch, to whom I am indebted for many kind favors. The *type* is in the Museum of La Plata, the *allotype* in the writer's collection. Both of these types appear somewhat teneral and the wings are badly folded.

Edwardsina argentinensis, new species.

♂. Length about 8 mm.; wing 11 mm. ♀. Length about 8.5 mm.; wing 14 mm. The bodies of both specimens are rather shrunken, so a better idea of the size is conveyed by the wing measurements.

Mouth parts and palpi light yellowish brown. Antennae with the scapal segments and the base of the first flagellar segment obscure brownish orange; remainder of the flagellum dark brown; flagellar segments nearly globular. Front cream-colored; vertex dark brown.

Mesonotal praescutum silvery gray with three conspicuous black stripes, the broad median stripe divided by a slight carina; scutal lobes black, the median area pruinose; scutellum black, more pruinose basally. Pleura light gray. Halteres dark brown, the base of the stem obscure orange. Legs with the coxae and trochanters obscure yellow; remainder of the legs brownish testaceous, the terminal tarsal segments darker.

Wings grayish subhyaline; veins dark brown; wings very large and ample for the size of the insect; anal angle very conspicuous. Venation: *R*1 thick with numerous short macrotrichiae; the section of *Rs* interpreted as being a spur in *E. chilensis* is here so long and of such a course that it appears to be the true base of the sector, although the extreme basal connection is atrophied; the vein that was interpreted as the base of the sector in *E. chilensis* would thus appear to be a crossvein, presumably *r*; *R*2+3 short, about as long as *r-m*; *R*4+5 parallel with *R*3 basally but soon diverging, ending immediately behind the wing-apex which is very obtuse; *r-m* opposite the fork of *M*; no decided curvature on *M*1 to indicate the position occupied by the atrophied *M*2.

Abdomen dark brown, the pleural membrane more grayish.

Habitat.—Argentina. *Holotype*, ♂, Rio Diamante, southern Mendoza, January, 1921 (Dr. Carette). *Allotopotype*, ♀.

Edwardsina argentinensis differs from the genotype, *E. chilensis*, in its larger size, dark coloration of the body, the slightly different wing-venation and the more conspicuous anal angle of the wing.

University of Michigan-Williamson Expedition to Brazil

A zoological expedition to the interior of Brazil has been organized at the Museum of Zoology, University of Michigan, through the interest and support of Mr. E. B. Williamson, Honorary Curator of Odonata. It is to be known as the University of Michigan-Will amson Expedition. The members of the expedition are Mr. Jesse H. Williamson and Capt. John Strohm, U. S. A. Both men have had wide experience in the tropics, and are outfitted in a most excellent manner for the prosecution of their work. They will leave New York on December 15, 1921, and will be in the field for about eight months according to their present plans. If particularly favorable conditions are encountered, a longer time may be spent in their explorations.

The region to be investigated is that of the Sierra de Parecis and the country westward toward the Bolivian frontier. The party will proceed directly to Manaos and then to Pt. Velho, which town will probably be their general headquarters for their explorations to the south and west.

The Odonata will receive the most detailed study, other groups to be collected are the Formicidae, Orthoptera, Lepidoptera, Diptera and Arachnida, and in addition to the Arthropoda mentioned much attention will be given to the reptiles, amphibians and shells.—FREDERICK M. GAIGE, Ann Arbor, Michigan.

A New North American Psychid (Lep., Psychidae.)

By FRANK MORTON JONES, Wilmington, Delaware.

Oiketicus toumeyi n. sp.

♂.—Head, thorax and abdomen including the legs, tawny yellowish brown, hairy, the eyes black. The antenna with about 36 joints, brown, basally broadly bipectinate, the branches narrowing abruptly about three-fifths the length of the shaft from the base. The anterior tibia bears a slender, flattened, strap-like appendage, one-half as long as the tibia. The abdomen is long and slender, exceeding the wings by the width of the secondaries.

The wing veins are yellowish brown; the wings are glassy, as in *ephemeraeformis*, and are only very sparsely speckled with a few dark scales, which are more dense along the costa of the secondaries; the anal area of the secondaries is semi-opaque with brown hairs. The primaries are narrow and moderately acute, the costa almost straight, the outer margin oblique; the costa of secondaries is arched, the apical angle acute, the outer margin almost straight to the second cubital vein, below which the anal area is somewhat produced and the margin rounded. The primaries usually have 12 veins, the secondaries 8, with M2 and M3 (5 and 4) of both wings stalked to the cell; but M2 (5) is occasionally obsolete or partially so. The anal veins of primaries are as in *abboti* Grt. Wing expanse, 28 to 32 mm.

Type locality, Tucson, Arizona. Described from numerous bred specimens; the *type* is in the collection of the author, and paratype material will be distributed.

This is almost certainly the insect mentioned by Dr. J. W. Toumey (Bull. 9, Ariz. Ag. Exp. Sta., 1893) as "*Thyridopteryx* sp.," abundant on locust trees in the vicinity of Tucson; the general resemblance of its larval case to that of *townsendi* Ckll. has probably prevented its earlier recognition as distinct, though the moths of *toumeyi* and *townsendi* are very unlike.

Lice and a Horsefly Transmitting Disease (Dip., Tabanidae).

The United States Public Health Service announces that the researches of Doctors Edward Francis, Bruce Mayne and G. C. Lake show that the rodent disease, tularaemia, due to *Bacterium tularense* in the blood, which is very fatal to jack rabbits in Utah, is transmitted from rabbit to rabbit by their lice and from rabbits to man by the blood-sucking horsefly, *Chrysops discalis*.

Tularaemia is seldom fatal to man, only one death due to it being known. It is a septic fever, occurring in Utah, lasting 3-6 weeks, with slow convalescence. Its economic consequences, therefore, may be serious when it attacks farmers and lays them up in midsummer and in harvest seasons.

Libellulas Collected in Florida by Jesse H. Williamson, with Description of a new Species (Odonata).

By E. B. WILLIAMSON, Bluffton, Indiana.

Mr. Jesse H. Williamson collected dragonflies in Florida from March 1 to April 26, 1921. Localities visited and dates are as follows: Sebring, March 1; Fort Myers, March 3-7 and 10-19; Taxambas, Marco Island, March 8; Labelle, March 21-27; Moore Haven, March 29-30 and April 2; Palmdale, March 31 and April 3-8; enroute Moore Haven to West Palm Beach, across Lake Okeechobee, April 9; Miami, April 12; Enterprise, April 15-26. From April 29 to May 9 he collected at Kathwood, Aiken County, South Carolina, but on these dates most of the species observed were just emerging. Among the 4547 specimens collected, representing 65 species, are several new and many interesting things, the most remarkable and surprising of which is the fine *Libellula* described below. This Florida collection has been studied and arranged by J. H. W. and duplicates are being distributed to students and institutions.

Libellula jesseana new species.

Abdomen: ♂, 38-40; ♀, 35; hind wing, ♂, 41-43; ♀, 43; stigma, front wing, 6-6.8 mm.

♂.—Labium brown with a slight greenish cast; genae and mandibles similar, the latter more yellowish; labrum black; anteclypeus greenish brown; postclypeus, frons, antennae and frontal vesicle black, the latter nearly squarely truncate, the externoapical points shining; occiput black; rear of head brown with greenish or yellowish tinges and with a more or less distinct paler spot against the eye at midheight and another larger one below this.

Dorsum of prothorax and thorax black pruinose; mesepimeron and metepisternum similar but paler, more or less shaded, especially about the humeral and second lateral sutures, with greenish or yellowish brown; the metepimeron and thorax beneath this paler color.

Abdomen slender; above the lateral carina black; below the lateral carina brown to black with a greenish or yellowish cast and a more or less distinct yellowish area on either side posterior to the posterior transverse carina on each of segments 2-8; sterna brown to black; appendages brown to black.

Ventro-external face of the genital hamule roughly triangular in

shape, the posterior edge nearly at right angles to the abdomen, the antero-dorsal edge relatively long, longer than in *auripennis*, so that the face of the hamule is relatively broader in *jesseana*. In *incesta* the anterior angle is obliterated in a curve joining the antero-ventral and the antero-dorsal edges, and the face is relatively slender as in *auripennis*.

In a younger male the labium, genae and mandibles are pale dull yellow, the postclypeus shades out to dark greenish adjacent to the eyes, and there is a green spot on the frons, against the eye, just above this. The dorsum of the thorax is brown with a purplish cast; the sides of the thorax are largely pale yellow with the posterior two-thirds of the mesepimeron and the upper part of the metepisternum darker, thus defining two more or less distinct pale stripes, one just posterior to the humeral and the other just posterior to the second lateral suture. Dorsum of abdomen similarly paler, 3-6 slightly lighter in color and yellowish adjacent to the lateral carina: 7-9 with a longitudinal dorsal black stripe occupying about one-third the area on each side between the middorsal line and the lateral carina (probably in younger individuals this dorsal black stripe is defined on more basal segments); 10 and appendages yellowish brown; abdomen beneath, between the lateral and ventral carinae, pale greenish or yellowish on 2 and 3, shading darker to greenish or yellowish brown on the segments posterior to 3, a more or less distinctly darker subapical area on either side of each segment; sterna at base of 3 and on 9 and 10 yellowish, otherwise dark to black.

Coxae pale yellowish to pruinose brown; legs brown to nearly black; femora paler at base and with the dorso-posterior surface pale yellowish to brown, darker apically.

Wings basally, posterior to *A* and proximal to the distal angle of the triangles, hyaline; remainder of wing reddish yellow, sometimes slightly more intense in the area between nodus and stigma, the extreme apex very narrowly and inconspicuously dusky tipped; the basal spaces anterior to *A* are not as deeply tinged as the apical portion of the wing. Venation basal to about the level of the triangles dark to black; distal to this point all the veins are reddish yellow excepting the veins on the anterior and posterior sides of the stigma and the posterior wing margin, which are black; stigma dragon's blood red (Ridgway). For venational characters see following the description of the female wings.

♀.—Labium pale dull yellowish brown; genae and mandibles greenish; labrum yellow with a large median basal rounded black spot which is joined basally on either side with a more or less extensive lateral spot which reaches and extends more or less along the anterior margin but does not attain the lateral margin above; anteclypeus greenish brown; postclypeus and frons brown to nearly black, each on either side in front, against the eye, with a greenish or bluish spot; occiput brown; rear of head brown, similar to that of the male.

Thorax as in the younger males, the sides more uniformly yellowish,

the darker posterior areas on the mesepimeron and on the metepimeron and on the upper part of the metepisternum only slightly or not at all evident, so the pale stripe posterior to the humeral and to the second lateral suture are not as well marked as in the male or are wanting altogether, disappearing in the prevailing pale color of the sides.

Abdomen similar to younger males; the dorsal longitudinal black stripe described on 7-9 is faintly discernible as a darker stripe on 2-9 in the female; 8 perfoliate.

Wings hyaline, more or less yellowish tinged in the basal spaces anterior to *A*, and along the costal border, especially distal to the nodus and anterior to *R;* apex to level of stigma dusky, the inner edge diffuse; costa yellow except at base, clearest and brightest between nodus and proximal end of stigma, distal to which point it is black; nodus and subnodus more or less yellow; the other veins dark to black; stigma burnt sienna (Ridgway), apical fourth or third black; the dark color produced basally along the anterior and posterior borders, especially the former; enclosing veins black. Venational characters below. Legs as in the male.

Venational characters of both sexes.—Antenodals, front wing 17 to 19, usually 19; hind wing 13 to 15, usually 14; postnodals, front wing 11 to 14, usually 12 or 13; hind wing 12 to 16, usually 13 or 14; triangle front wing with 2 or 3 crossveins, usually 2; hind wing 1; crossveins in supertriangle front wing 0 to 2, usually 1; hind wing 0 or 1, usually 0; cells in subtriangle front wing 5 or 6, usually 5; cells in loop posterior to subtriangle, front wing, 2 or 3, usually 2; cubito-anal crossveins front and hind wings, 1; bridge crossveins front and hind wings 3 to 5, usually 4 or 5; triangle front wing followed by 4 or 5 cells, usually 4, then 3 or 4 followed by 4 increasing; 2 rows of cells between M4 and Mspl in front and hind wings; crossveins against the distal transverse side of the anal loop on its proximal side 4 or 5; crossveins against the proximal side of the anal loop on its distal side 9 to 11, usually 9.

Enterprise, Florida, April 22 and 26, 1921, 44 males, 2 females, collected by Jesse H. Williamson, for whom this handsome species is named. *Type* male and *allotype* female, taken in copulation, April 26, 1921, in coll. E. B. W.

Both sexes of *jesseana* are separated at once from those of *auripennis* by the darker face and frons, and dorsum of thorax and abdomen. In wing coloration the male differs from *auripennis* in the more intense reddish yellow of the wings posterior to *R,* the color in *auripennis* being more intense along the costal border. In the females of the two species there is little or no difference in the wings except that the costa basally is darker in both sexes of *jesseana* than in the

sexes of *auripennis*. From the related species with dark colored bodies *jesseana* is separated at once by the reddish yellow unspotted wings of the male and the red stigma of the male and the burnt sienna stigma of the female. From *flavida*, *jesseana* is separated, among other characters, by the absence of dark colored basal wing markings.

About Enterprise are many small lakes, locally called ponds. Collections were made at eight of these, four north of the town and four east. All ponds are of the same general character, though some are more marshy than others. They lie about twenty feet below the general land surface among turpentine pine hammocks. The soil is sand and there are no inlets or outlets to the ponds. The water is clear and cold and fit to drink. Seven of the ponds were without any *Libellula* inhabitants. At the eighth pond *Libellula jesseana*, and no other *Libellula*, was taken. In J. H. W.'s notes this eighth pond, in the absence of any local name, is designated as Figure-8 Pond. It lies two and one-half miles (estimated) north of the town, going out the hard shell road past the cemetery. It is about a quarter of a mile east of the road and about half a mile due north of Buckeye Homestead Pond. The latter pond can be seen from the road. Gleason's Pond lies about three quarters of a mile east of Buckeye Homestead Pond. North of Gleason's Pond lies Wiley Pond.

Figure-8 Pond is about one-quarter of a mile long and one-eighth wide, shaped roughly like the figure 8. It has a solid sand bottom, deepening more rapidly than other ponds visited, being waist deep four or five feet from shore. Grassy sedges, shoulder high, grow from the water's edge out into the water for a distance of five or six feet. Then, within this zone, is a clear water zone eight to twelve feet wide, within which is another belt of vegetation several feet wide and rising above the water one or two feet. There are no bushes in the water and no marsh. The banks from the water's edge are steep sand with sparse dead grass and scattered young pines two to ten feet high. All around the pond the higher ground had been recently burned over but fire had reached the pond only at a few points, leaving some green pines near the water's edge.

Jesseana was usually over the shore-bordering zone of sedges, alighting on stems and leaves, and, when back from the water, on the bare twigs of the burned pines. It is very wary and difficult to approach, and is a good dodger either when at rest or on the wing. In general habits it mostly resembles *L. auripennis*. Other species associated with *jesseana* were *Tramea carolina, Coryphaeschna ingens, Anax longipes,* a *Progomphus,* and *Enallagma doubledayi.*

The question whether *jesseana* might not be a hybrid of *auripennis* and some other species naturally suggested itself. Libellulas generally are of wide distribution and their habits as imagoes render them conspicuous. No new species has been added to the eastern North American fauna in over fifty years, and the discovery of an undescribed species in Florida was a great surprise. At first I was inclined to regard it as a hybrid, but on farther study I have abandoned this opinion. Its general appearance, due to wing coloration, at once suggests *auripennis*. Dr. Calvert and Dr. Ris, writing independently, see something of *flavida* in it, but neither attributes this to hybridization and Dr. Ris especially is convinced it is not a hybrid. Dr. Kennedy also considers it specifically distinct and not a hybrid. In its restricted distribution and its suggestive synthesis of characters *jesseana* resembles another dragonfly in another subfamily which I know well. *Macromia wabashensis* is known only along two or three miles of the Wabash River near Bluffton, Indiana, where it has been found continuously from 1902 to 1921. In characters it is just what one might expect from the crossing of *M. taeniolata* and *M. pacifica*, both of which species, as well as *M. illinoiensis*, occur on the same stretch of river. If *wabashensis* is a hybrid it has certainly held its own for at least twenty years. It is possible that failure to record it elsewhere may be due to lack of collecting. This last factor can hardly be used to explain the limited known distribution of *L. jesseana*. It remains to be seen if *jesseana* maintains itself and is able to extend its range from the single small lake where it is now known to occur.

Other species of *Libellula* collected by J. H. W. are listed below. Species of *Ladona* are not included in this paper. A few specimens collected in 1904, 1906 and 1908, by Mrs. Stella Deam, and in 1911 and 1913 by L. A. Williamson are also recorded. All notes on habits and captures are from J. H. W.'s field notes.

Libellula auripennis Burmeister, West Palm Beach, February 24, 1904, teneral female (Deam); Salt Lake, near St. Petersburg, April 21, 1908, female (Deam); March 26, 1913, three teneral males (L. A. W.); Sarasota, April 4, 1911, two males, two females (L. A. W.); Taxambas, Ft. Myers, Labelle, Moore Haven, Palmdale, Miami and Enterprise, forty males and thirty-nine females, tenerals and adults at each location. Kathwood, South Carolina, a single teneral male.

Auripennis is found scattered over fields and pastures, often far from water. Adult males with red abdomens flew swiftly over or near open streams in fields. Adults difficult to catch. Some, but not all, of the males from Enterprise have the wings more extensively reddish yellow than any other specimens in the collection. In this character they approach but do not reach the intensity of *L. jesseana*. Otherwise they are typical *auripennis*.

Libellula incesta Hagen. Labelle, fifteen males, one female; Palmdale, thirty-six males, fifteen females; Enterprise, one male, one female. Found on wooded part of Pollywog Creek at Labelle and of Fisheating Creek at Palmdale, and seen nowhere else about these two towns.

Of the seventeen females in the collection all but two have a distinct dark postnodal streak between *C* and *R*. It is also present in about one-half of the males. In both sexes it varies from entirely absent, through faintly present to clearly present and, finally, in the most extreme cases, it becomes a continuous brown streak from nodus to stigma. The streak is darkest in tenerals of both sexes, but all tenerals do not have it; the darkest specimens seen are teneral females. This wing marking is not therefore entirely sexual or ontogenetic, though it tends to be both, being darker in females and in tenerals.

Libellula axilena Westwood. Daytona Beach, March 26, 1906, one female (Deam); St. Petersburg, March 13 and 22, 1913, one male and three females, all very teneral (L. A. W.); Fort Myers, Labelle, Palmdale and Enterprise, fourteen males and nine females.

All the specimens of *axilena* are young with the teneral body color pattern distinct, and the postnodal wing streak between *C* and *R* and nodal spots are present in every specimen. In every specimen but one the brown area about the metastigma is continuous with the brown area anterior to it. In every case the brown stripe on the second lateral suture is wider than in *vibrans*, and between this stripe and the dorsal thoracic dark area, on the side of the thorax above, is a triangular brown area which is entirely wanting in *vibrans*. In *vibrans* the postnodal wing streak is present in one female, faintly present in two males and two females, and absent in nineteen males and fourteen females. In every case the brown area surrounding the metastigma is separated from the dark area anterior to it, and the sides of the thorax above, between the humeral and second lateral sutures, are entirely pale.

The color pattern of the thorax as well as the pale face and frons thus separate *vibrans* certainly from *axilena*.

At Fort Myers, flying about and alighting on dried vegetation in the sun along a fence separating a cemetery and orange grove. This species and *vibrans* were not recognized as distinct when captured and it is impossible now to state definitely any difference in habitats. In L. A. W.'s material collected at St. Petersburg, March 22, a male of *vibrans* and a female of *incesta* are papered in the same envelope. His other specimens of *axilena* were taken on March 13, three and one-half miles southwest of St. Petersburg, while his twelve specimens of *vibrans* were taken on March 22, four miles southwest of town. J. H. W. collected *axilena* on thirteen days and *vibrans* on ten days in Florida. On four different days he took both species, on nine days he caught *axilena* and not *vibrans*, and on six days *vibrans* but not *axilena*. Both species certainly occurred in the same creek-enclosing woodlands at Palmdale and Enterprise, but were not found on the creeks themselves. Apparently *axilena* frequented more open spots and the edges of forests, while *vibrans* preferred denser forest.

Libellula vibrans Fabricius. St. Petersburg, March 22, 1913, five males and seven females, all teneral (L. A. W.); Port Orange, March 16, 1906, one male, one female (Deam); New Smyrna, April 24, 1906, one male (Deam); Fort Myers, Labelle, Palmdale and Enterprise, fourteen males and eight females; Kathwood, South Carolina, two males. For notes see above under *axilena*.

List of the Tachinidae (Diptera) of North Carolina.

By C. S. BRIMLEY, Div. of Entomology, N. C. Dept. of Agriculture.

The following list includes all those species of Tachinidae which are known to us to have been recorded from North Carolina.

Most of them have been collected by members of the Entomological Division of the State Department of Agriculture, and the collector's initials follow the records attributed to each. The names of those contributing to the list are Franklin Sherman, Chief in Entomology for the last twenty years; G. M. Bentley, C. S. Brimley, J. E. Eckert, C. O. Houghton, R. W. Leiby, C. L. Metcalf, Z. P. Metcalf, T. B. Mitchell, and R. S. Woglum, his assistants at various periods. Other records have been contributed by Mr. C. W. Johnson, of the Boston Society of Natural History, and some by Mr. Max Kisliuk, Jr., now with the Federal Horticultural Board.

The flies of this family have been identified for us in the past by the late Mr. D. W. Coquillett, and by Professor O. A. Johannsen, and more recently by Prof. J. M. Aldrich, to all of whom our thanks are due. These gentlemen are responsible for over three-fourths of the names on the list, while I am accountable for the remainder, mostly conspicuous, well defined forms.

Several names in the list are given with the generic name only or as near such a species. These were all given by Prof. Aldrich as being probably new species.

Undoubtedly the list is far from complete, and it is quite likely that it is not wholly free from error, still we believe it to be a creditable beginning.

ACEMYIA DENTATA Coq. Raleigh, late March, 1913, CLM; Linville Falls, early June, 1920, FS; Onslow Co., late March, 1920, MRS.

ADMONTIA DEGEERIOIDES Coq. Raleigh, mid September; Swannanoa, Oct. 5, 1915; mid July, 1919, RWL.

ALOPHORA FENESTRATA Bigot. Raleigh, early April, one, CSB.

ALOPHORA FUMOSA Coq. Hot Springs, Mrs. A. T. Slosson.

ALOPHORA GRANDIS Coq. Raleigh, late March, mid and late October, four males; early May, 1920, one female, CSB; Laurinburg, Sept. 11,

1920, male, TBM; Elizabethtown, early November, 1920, three males, TBM.

ALOPHORA SPLENDIDA Coq. Blowing Rock, September 4, 1915, RWL.

ARCHYTAS ANALIS Fab. Whole state, May to early November; has been bred from army worm in Haywood and Beaufort Counties in August and September by Mr. Sherman and Mr. Leiby.

ARCHYTAS ATERRIMA Desv. Whole state, mid April to early November. Has been bred from fall webworm at Raleigh, July 25, 1907, CSB.

ARCHYTAS HYSTRIX Fab. Raleigh, Lumberton, Southern Pines, Thomasville, late June to early September. Has been bred from *Datana perspicua* at Raleigh, June 24, July 5, 1918, CSB.

ARCHYTAS LATERALIS Macq. North Carolina, Coquillett, Rev. Tachinidae, p. 143.

ATACTA BRASILIENSIS Schiner. Raleigh, July 25, 1906, CSB.

ARGYROPHYLAX (sp.). Raleigh, Sept., one, CSB.

BELVOSIA BIFASCIATA Fabr. Lumberton, Southern Pines, Raleigh, Hendersonville, and Lake Toxoway, mid May to late October. Has been bred from *Citheronia regalis, Basilona imperialis, Anisota senatoria,* and *Ceratomia undulosa.*

BELVOSIA UNIFASCIATA Desv. Lake Ellis, Terra Ceia, Raleigh, Crabtree, and Spruce, mid May to late October. Bred from army worm in Haywood (mid August, 1914, FS), and Beaufort (late August and early September, 1919, RWL) Counties.

BESKIA AELOPS Walker. Raleigh, June 15, 1906, CSB; Sept. 26, 1917, RWL; Stem, early October, 1908, ZPM.

BLEPHARIPEZA ADUSTA Loew. Raleigh, late March and mid April, CSB.

BLEPHARIPEZA LEUCOPHRYS Wied. Blowing Rock, Sept. 15, 1915, FS.

BOMBYLIOMYIA ABRUPTA Wied. Blowing Rock, Grandfather Mountain and Highlands, all in September, and Grandfather Mt., also in late July. Ranges to over 5,000 ft. elevation.

CHAETOGAEDIA ANALIS V. d. W. Grandfather Mt., August, 1906, RSW.

CHAETOGAEDIA CREBRA V. d. W. Raleigh, mid November, 1911, CSB.

CHAETOPHLEPS SETOSA Coq. Raleigh, late June, 1912, CLM.

CHAETOPLAGIA ATRIPENNIS Coq. Raleigh, late July, one, CSB.

CISTOGASTER IMMACULATA Macq. Raleigh, late April to early August, common, CSB; Charlotte, early June, 1902, FS; Fayetteville, late May, 1920, CSB; Jefferson, mid September, 1912, FS.

CLAUSICELLA USITATA Coq. Wilmington, mid May, 1905, FS.

CUPHOCERA FUCATA V. d. W. Raleigh, late June, 1920, CSB.

CRYPTOMEIGENIA THEUTIS Walker. Raleigh, April 5, 1901, FS; April 13, 1906, CSB; Black Mts., late May, 1911, FS.

DINERA FUTILIS Smith. Highlands, Sept., 1906, FS.

DISTICHONA AURICEPS Coq. Raleigh, mid Sept., CSB; Blowing Rock, Sept. 9, 1909, ZPM.

DISTICHONA VARIA V. d. W. Raleigh, late June to mid Sept., CSB; Charlotte, late June, 1902, FS.

DORYPHOROPHAGA ABERRANS Twnd. Swannanoa, mid July, 1919, RWL.

DORYPHOROPHAGA DORYPHORAE Riley. Terra Ceia, Aug. 24, 1919, RWL.

ECHINOMYIA DAKOTENSIS Twnd. Raleigh, late Sept., 1915, early Oct., 1919, CSB; Highlands, early and mid Sept., 1906, RSW; Yonahlosse Road, Sept. 10, 1908, ZPM.

ECHINOMYIA FLORUM Walker. Raleigh, late April, early May, Sept., CSB; Southern Pines, April, 1901, FS; Gibson, Oct. 12, 1920, and Elizabethtown, Nov. 5, 1920, TBM.

EPALPUS SIGNIFERUS Walker. Raleigh, early Aug, CSB; Norlina, late April, 1905, FS; Craggy Mt., June 8, 1916, RWL; Linville Falls, early June, 1920, FS.

EPIGRYMIA FLORIDENSIS Twnd. Raleigh, mid July, 1912, CLM.

ERVIA TRIQUETRA Oliv. Raleigh, early Sept., 1916, FS; Southern Pines, June 6, 1906, RSW.

EULASIONA (sp.). Linville Falls, late May, 1920, FS.

EUPHOROCERA FLORIDENSIS Twnd. Terra Ceia, bred from pupae green clover worm, August and September, 1919, RWL.

EUTHERA TENTATRIX Loew. Swannanoa, Oct. 5, 1915, RWL.

EXORISTA BOARMIAE Coq. Plymouth, bred from *Acrobasis nubilella*, RWL; bred from green clover worm pupae at Terra Ceia (Aug.-Sept., 1919, RWL), and at Elizabeth City (Aug.-Sept., 1919, FS).

EXORISTA EUDRYAE Twnd. Raleigh, bred from larvae *Euthisanotia grata*, June 14, 1907; from cocoon *Estigmene acrea*, May 8, 1918, and from larvae *Euthisanotia unio*, May 8, 1918, CSB: taken late June, 1915, CSB.

EXORISTA FLAVIROSTRIS V. d. W. Raleigh, bred from cocoon *Lagoa crispata*, June 6, 1906, CSB.

EXORISTA FUTILIS O. S. Raleigh, late April, mid June, CSB.

EXORISTA GRISEOMICANS V. d. W. Raleigh, early June, 1904, bred from cocoon *Lagoa crispata*, FS; early Sept., 1912, bred from fall army worm, CLM.

EXORISTA LOBELIAE Coq. Raleigh, early July, 1907.

EXORISTA PYSTE Walker. Raleigh, late Oct., CSB; Millbrook, bred from *Acrobasis caryae*, June, 1917, RWL; Roper, June 5, 1917, bred from *A. caryae* and *A. nebulella*, RWL; Burgaw, June, 1917, and Plymouth, June, 1916, bred from *A. nebulella* at both places, RWL.

EXORISTA SETINERVIS Coq. Raleigh, late July, FS.

EXORISTA SLOSSONAE Coq. Raleigh, mid July, 1914, CLM.

EXORISTOIDES JOHNSONI Coq. Raleigh, May, Sept. 23, 1920, CSB; Hertford County, Coquillett, Rev. Tachinidae, p. 91.

FRONTINA ALETIAE Riley. Raleigh, July, Sept., bred from fall webworm, CSB; Terra Ceia, Aug.-Sept., 1919, bred from pupae green clover worm, RWL; Elizabeth City, mid Aug., 1919, FS.

FRONTINA near ALETIAE, but palpi black. Raleigh, June, CSB.

FRONTINA FRENCHII Will. Raleigh, common parasite of the overwintering cocoons of the Polyphemus moth, adults emerging from late April to early August, the maggots overwintering within the cocoon and boring their way out at various times during spring and summer to pupate; occasionally they pupate within the cocoons of their host and perish, CSB; bred from tent caterpillar at Milbrook, May, 1915, RWL; Blowing Rock, Sept., 1915, FS.

FRONTINA VIOLENTA Walker. Raleigh, bred from larvae of *Pholus achemon*, in late Sept., 1914, and early Oct., 1915, CSB.

GAEDIOPSIS OCELLARIS Coq. Early May and late Oct., 1920, CSB.

GONIA CAPITATA DeG. Raleigh, late March to early May, not uncommon, CSB; Southern Pines, March 20, 1905, FS; Southport, April 6, 1914, CLM; Lake Waccamaw, April 1, 1914, CLM.

GONIA SENILIS Will. Raleigh, June, Oct., FS and CSB; Kingsboro, early Oct., 1919, MRS.

GYMNOCHAETA ALCEDO Loew. Black Mt., late May, 1910, FS; Hendersonville, June, 1907, FS.

GYMNOSOMA FULIGINOSA Desv. Raleigh, Hillsboro, Blowing Rock, Swannanoa and Linville Falls, early May to mid November, not uncommon.

HEMYDA AURATA Desv. Raleigh, late Sept., late Oct., CSB; Linville Falls, early June, 1920, FS.

HILARELLA FULVICORNIS Coq. Murfreesboro, June 9, 1895, CWJ.

HYALOMYODES TRIANGULIFER Loew. Raleigh, Nov. 9, 1920, CSB; Highlands, Sept. 9, 1920, TBM.

HYPOCHAETA LONGICORNIS Schiner. Raleigh, Sept. 17, 1906, bred from *Melittia satyriniformis*, CSB; Sept. 29, 1920, CSB.

HYPOSTENA DUNNINGI Coq. Revision Tachinidae, p. 60.

HYPOSTENA FLAVEOLA Coq. L. c., p. 61.

HYPOSTENA FLORIDENSIS Twnd. L. c., p. 62.

JURINIA ADUSTA V. d. W. Blowing Rock, Aug. 24, 1902, FS; Waynesville, Sept. 9, 1919, JEE.

LESKIOMIMA TENERA Wied. Raleigh, June 14, 1906; late July, CSB.

LEUCOSTOMA SENILIS Twnd. Murfreesboro, early June, 1895, CWJ.

LEUCOSTOMA ATRA Twnd. Lake Waccamaw, Sept. 20, 1915, RWL; Highlands, Sept. 5, 1920, TBM.

LINNAEMYIA COMTA Fallen. Raleigh, early June to late Nov., not uncommon; also taken at Murfreesboro, Hendersonville, Blowing Rock, Swannanoa and Wilmington.

MACQUARTIA PRISTIS Walker. Spruce, June, 1911, several, FS.

MASICERA ALBIFACIES Twnd. Raleigh, Aug. 15, 1901, bred from *Loxostege mancalis*, CSB.

MASICERA EUFITCHIAE Twnd. Linville Falls, late May and early June, 1920, several, FS.

MASICERA EXILIS Coq. Elizabeth City, bred from tortoise beetle larva (*Coptocycla clavata*), Aug. 22, 1919, FS.

MASIPHYA BRASILIANA B. & B. Raleigh, June 11, 1906, late June, 1920, CSB.

METAPLAGIA OCCIDENTALIS Coq. Raleigh, July 26, Aug. 4, 1906, bred from boll worm (*Heliothis obscurus*), CSB.

METOPIA LEUCOCEPHALA Rossi. Raleigh, mid Oct., 1904, GMB; Southern Pines, late April, 1905, GMB; Pendleton, early June, 1895, CWJ.

MICROPHTHALMA DISJUNCTA Wied. Murfreesboro, June 9, 1895, CWJ; Greensboro, Aug. 25, 1902, FS; Blowing Rock, Aug., 1906, FS; Black Mts., July 18, 1919, RWL; Grandfather Mt., early Sept., 1915, FS; ranges up to 5,000 ft.

MYIOPHASIA AENEA Wied. Raleigh, Gibson, Elrod, Boardman, August, September and October; Charlotte, early June, 1902, FS; not uncommon.

NEOPHYTO SETOSA Coq. Raleigh, mid April, CSB; Spruce, late May, FS.

OCYPTERA ARGENTATA Twnd. Beaufort, mid June, 1903, FS.

OCYPTERA CAROLINAE Desv. Raleigh, Spruce, Swannanoa, Murfreesboro and Elizabeth City, early June to early September; not uncommon.

OESTROPHASIA CALVA Coq. Raleigh, May 25, 1905, FS; June, CSB.

PACHYOPHTHALMUS SIGNATUS Meigen. Raleigh, mid July, 1912, CLM; March 29, 1920, bred from mud cell of Eumenid wasp, MRS; Jefferson, mid Sept., 1913, CLM.

PANZERIA AMPELUS Walker. Raleigh, early and mid April, CSB; Southport, April 6, 1914, CLM; Spruce, late May, 1912, and June, 1911, FS; Blowing Rock, Sept. 4, 1915, RWL; Highlands, Sept., 1906, RSW; Blantyre, Sept., 1906, RSW.

PARACHAETA BICOLOR Macq. Spruce, June, 1911, FS.

PARADEXODES (sp.). Swannanoa, mid July, 1919, RWL.

PARADIDYMA SINGULARIS Twnd. Raleigh, Oct. 9, 1920, CSB; Wilmington, April 15, 1919, MK.

PELETERIA ROBUSTA Wied. Raleigh, June 13, 1907, CSB; Blowing Rock, late July, 1904, FS; Sept. 4, 1915, RWL; Sept., 1918, FS; Elizabethtown, Nov. 5, 1920, three, TBM.

PELETERIA TESSELLATA Fabr. Blowing Rock, late August, 1902, COH.

PHORANTHA PURPURASCENS Twnd. Elizabethtown, Nov. 5, 1920, TBM.

PHOROCERA CLARIPENNIS Macq. Has been bred at Raleigh from pupae of *Ceratomia undulosa* (Aug. 14, 15, 1911, CSB); *Datana integerrima* (Aug. 2, 1916, RWL; Aug. 16, 1920, CSB); *Melalopha inclusa* (Aug. 11, 1915, CSB); sawfly, *Lophyrus* (April, 1912, CSB); cutworm, *Feltia subgothica* (June 11, 1920, CSB); at Milbrook, from apple tree

tent caterpillar, late May, 1915, RWL; at Crabtree from army worm (Aug. 15, 1914, FS); at Wilmington, from fall army worm (July 26-28, 1920, CSB); at Terra Ceia from army worm and green clover worm (Aug.-Sept., 1919, RWL), and from army worm at Neuse (mid Aug., 1914, FS). Also taken at Beaufort and Swannanoa in July and August.

PHOROCERA COMSTOCKI Will. Raleigh, bred from *Cossula magnifica*, June 19, 1916, RWL.

PHOROCERA EINARIS Smith. Elizabeth City, late August, 1919, FS; Spruce, late May, 1912, CSB.

PHOROCERA LEUCANIAE Coq. Raleigh, mid Aug., 1903, FS; mid June, 1914, CLM.

PHOROCERA TORTRICIS Coq. Raleigh, mid June, 1914.

PLAGIA AMERICANA V. d. W. Raleigh, Nov. 6, 1920, CSB.

PSEUDOCHAETA ARGENTIFRONS Coq. Raleigh, bred from *Loxostege mancalis*, Aug. 14, 1906, CSB.

PSEUDOTACHINOMYIA WEBBERI Smith. Linville Falls, late July, 1920, several, FS.

SCHIZOCEROPHAGA LEIBYI Twnd. Aydlett, Currituck Co., bred from sawfly larvae (*Schizocerus privatus*), July 31, 1915, RWL.

SENOTAINIA RUBRIVENTRIS Macq. Pendleton, June 7, 1895, CWJ; Charlotte, early June, 1902, FS.

SENOTAINIA TRILINEATA V. d. W. Raleigh, May, 1910, CSB; early and mid July, 1914, CLM; Elizabeth City, mid Aug., 1919, FS; Fayetteville, late May, 1920, CSB.

SIPHONA GENICULATA DeG. Hendersonville, July. 1907, FS.

SIPHOPLAGIA ANOMALA Twnd. Raleigh, early Oct., 1912; mid Oct., mid Sept., 1920, CSB; Elrod, Sept. 24, 1915, RWL.

SIPHOSTURMIA ROSTRATA Coq. Raleigh, Oct. 14, 1902, GMB.

SPALLANZANIA HEBES Fallen. Raleigh, late Sept., CSB; early Oct., FS; Swannanoa, July 10, 1913, CLM.

SPALLANZANIA HESPERIDARUM Will. Highlands, July 5, 1906, FS; Jefferson, mid Aug., 1907, mid Sept., 1912, FS.

STURMIA ALBIFRONS Walker. Raleigh, late June, 1907, ZPM.

STURMIA DISTINCTA Wied. Raleigh, July 11, 1913, bred from full grown larva *Phlegethontius quinquemaculatus*, mid July; bred from larva *Phlegethontius sexta*, Oct. 26, 1920, two males, CSB.

STURMIA FRAUDULENTA V. d. W. Raleigh, June 4, 1907, CSB.

STURMIA INQUINATA V. d. W. Raleigh, bred from larvae of *Phlegethontius cingulatus*, July 20, 1906, mid Aug., 1910 (42 from one larva), late July, 1910 (about 30 from one larva), and from pupa of *Ceratomia* (sp.), probably *undulosa*, May 8, 1918, CSB.

STURMIA PHYCIODIS Coq. Raleigh, mid July, 1912, CLM.

STURMIA PILATEI Coq. Lake Waccamaw, Sept. 20, 1915, RWL.

STURMIA STRIGATA V. d. W. Raleigh, July, August, bred from *Loxostege mancalis*, CSB.

TACHINA MELLA Walker. Raleigh, April 8, 1908, CSB; Milbrook, late May, 1915, bred from apple tree tent caterpillar, RWL; Murfreesboro, June 9, 1895, CWJ.

TACHINA ROBUSTA Twnd. Hendersonville, June, 1907, FS; Spruce, late May, 1912, FS; Linville Falls, early June, 1920, FS.

TACHINA RUSTICA Fallen. Blowing Rock, Sept. 0, 1909, ZPM.

TACHINAPHYTO VARIABILIS Twnd. Swannanoa, July 10, 1913, CLM.

TACHINAPHYTO (sp.). Raleigh, Sept. 29, 1920, five, CSB.

TRICHOPHORA RUFICAUDA V. d. W. Raleigh, Hendersonville, Hot Springs, Lake Waccamaw, Elizabeth City, late April to late October, rather common.

TRICHOPODA FORMOSA Wied. Hendersonville, June, 1907; Aquone, mid May, 1901, FS.

TRICHOPODA LANIPES Fab. Raleigh, mid June to early August, CSB.

TRICHOPODA PENNIPES Fab. Raleigh, Cranberry, Linville, Southern Pines, Lake Waccamaw, late May to September, common.

TRICHOPODA PLUMIPES Fabr. Raleigh, late June, early Aug., CSB; late July, 1912, CLM; Kittrell, July 15, 1919, TBM.

TRICHOPODA RADIATA Loew. Raleigh, mid July and early August, CLM and CSB.

WINTHEMIA QUADRIPUSTULATA Fab. Has been bred from army worm at Durham, Crabtree, Neuse, Terra Ceia, from fall army worm at Edenton, and from larva of *Perigaea sutor* at Raleigh. Other localities: Elizabeth City, Blowing Rock, Swannanoa, Black Mt., with a seasonal range of May to October.

WINTHEMIA (sp.). Linville Falls, late May, 1920, FS.

XANTHOMELAENA ARCUATA Say. Hot Springs, Mrs. Slosson.

XANTHOMELAENA ATRIPENNIS Say. Raleigh, early August, FS; late June, 1920, CSB; Blowing Rock, Sept., 1915, FS; Aug. 29, 1902, FS; Elizabethtown, Nov. 5, 1920, TBM.

YPOPHAEMYIA MALACOSOMAE Twnd. Millbrook, bred from tent caterpillar, May, 1915-6, RWL.

Some Cases of Aberrant Oviposition in Butterflies (Lep.).

By W. BUTHN, St. Clair Experiment Station, Port of Spain, Trinidad, B. W. I.

When in Ecuador in 1920, I was the puzzled observer of strangely perverted ovipositing habits on the part of three widely differing species of Butterflies; the abnormality of which I speak I had never noticed previously nor have I ever heard it remarked upon. In collecting wood-boring larvae I was examining some newly felled forest trees, locally called

"karuni"; although recently felled, the bark of these trees came off easily in large slabs, exposing the inner surface, which was covered with stagnated sap which had attained a condition of slimy fermentation, emitting a strong, acrid odor; attracted by this a *Perodromia,* the pattern of whose wings resembled tesselae of malachite and turquoise irregularly veined with black, settled on the trunk and began to imbibe of the liquid sap; a few moments later there also arrived to the feast a stately *Prepona,* also of a species which I have been quite unable to find described; this butterfly, in contradistinction to the former, sat with its wings folded, displaying the undersides of rich and deep, yet delicate shadings of dresden brown, cinnamon, russet and olive-gray, pencilled with blue-black and smoky maroon; very soon these two first comers were joined by a butterfly which quickly flew away again and which I took to be a *Callithea,* one or two *Hesperidae,* a large *Callidryas* resplendent in orange red and orange yellow, and strangely enough a *Heliconius cyrbia* which, after taking a few sips, sailed around the spot a few moments displaying its lovely wings of azurite blue, shading to black with crimson bands and white edged hind margins and then, to my great surprise, again alighted on the wet trunk and deposited eight eggs on the viscous timber. Unfortunately a heavy shower of rain now came on and the butterflies were driven away by the downpour.

The next day, being still in the same locality, I stripped off some more pieces of the bark and again a rather diversified congregation of insects resulted—a *Zeonia,* with tails as long as its own iridescent, transparent, scarlet blotched wings; a few *Gynaecia dirce,* one or two Catagrammas in golden brown, garnet and carmine, a large *Adelpha,* which, like the *Callithea,* however, did not remain long; an *Evenus* (*regalis*?) displayed its glorious scintillating, golden-green, peacock-blue and purple banded under surfaces; one of the locally numerous and varied Morphos for a short while settled, slowly opening and closing its great wings of profound, yet radiant blue changing with position to purples, and silvery-green; and again two unlikely butterflies that strangely enough, oviposited

on the tree trunk itself in spite of its utter unsuitability for larval existence; these were *Papilio epenetus* and what I took to be an *Agrias,* like the *Prepona,* the only one of its species I ever saw. In all instances the ova were deposited in a close group. I have seen the *Heliconius* and the *Papilio* ovipositing under natural conditions on *Passiflora* sp. and *Citrus decumana* respectively; the former deposits a single egg on the tip of a separate leaf; I never found more than one egg to a leaf. The *Papilio,* on the other hand, places its score or so of eggs in a close group; an *Agrias* of differing species, that I had been fortunate enough to observe, placed its eggs quite separately on the under sides of the leaves. In addition to the above perhaps interesting subject, I may be allowed to mention superficially one or two other insects attracted by the odor of the fermenting sap—two were very prominent—a fine Elater of silvery gray with a longitudinal red line at each side of the thorax and elytra, and black lines in centre and a lively Wasp with a sparkling green-blue body and shining bronze wings; early one morning a great "Harlequin" Beetle (*Macropus longimanus*) hanging on by its six-inch long forelegs after, presumably, a night's debauch, its grotesquely designed body markings of stripes and curved blotches in red, black and sage-green, making it a very conspicuous object. Another solitary and very large visitor was a giant locust of the genus *Tropidacris*; its crimson and black wings gave a spread of nine inches, with body and legs in proportion. In fair number, but making only a very short visit, came a colossal wasp, a *Sceliphron* (apparently near *nigripes*), but seeming to appreciate more the flowers of a *Caesalpina coriaria* nearby. In much larger numbers came the black stingless Bees and certain Sarcophagidae and Muscidae. Ants, strangely enough, were uninfluenced by the attraction.

On several occasions thereafter I tried the stripping of bark in places where Insect life was intensely abundant in numbers and very varied in species, but either the sap was not at the right stage of ripeness or the trees were not of the proper species, as all that resulted were Hesperidae, of course, and the equally expected Callidryas and Satyrinae.

I expect to return to the same localities again shortly and this time, having more fixed headquarters, I shall install a complete outfit of breeding cages for rearing the imagines and for making colored drawings of the metamorphoses of all procurable species of the splendid and little known Lepidoptera of this difficult, very unhealthy and therefore practically unmapped and entomologically unexplored country.

ENTOMOLOGICAL NEWS

PHILADELPHIA, PA., JANUARY, 1922.

The Boundless Field of Entomology

With the present number the NEWS begins its thirty-third annual volume and closely approaches its third of a century of existence. Many changes in entomological work and outlook have taken place in the years since the first issue of this journal. Like politics and trade, entomology has become more international and the insects of Asia and Africa intrude upon the American as do the wares of the Orient and measures for the relief of the Near East. We cannot shut out the rest of the world entomologically, even if we would.

Far from having catalogued the insects of the United States, we see an endless vista of new forms to be distinguished, even in parts of our country supposedly well known. "Species," which the entomologists of that day regarded as well established, have been split up into two or many forms. The limits of supposed intra-specific variation have been contracted and every difference between individuals assumes an importance which our predecessors disregarded or esteemed of little worth.

In every sub-division of our science the data are insufficient and the conclusions drawn from them of doubtful or temporary value. There is a superabundance of opportunity for him and for her who will study insects intensively and extensively.

The NEWS takes this opportunity of thanking all those who came to its aid by subscribing to the volume for 1921 at the increased price. While this price still holds for 1922, we think that signs are appearing looking toward a lessening of publication costs. When realized, this decrease will be placed to the advantage of our subscribers.

Entomological Literature

COMPILED BY E. T. CRESSON, JR., AND J. A. G. REHN.

Under the above head it is intended to note papers received at the Academy of Natural Sciences, of Philadelphia, pertaining to the Entomology of the Americas (North and South), including Arachnida and Myriopoda. Articles irrelevant to American entomology will not be noted; but contributions to anatomy, physiology and embryology of insects, however, whether relating to American or exotic species, will be recorded.

The numbers in **Heavy-Faced Type** refer to the journals, as numbered in the following list, in which the papers are published.

All continued papers, with few exceptions, are recorded only at their first installments.

The records of papers containing new genera or species occurring north of Mexico are grouped at the end of their respective Orders.

For records of Economic Literature, see the Experiment Station Record, Office of Experiment Stations, Washington. Also Review of Applied Entomology, Series A, London. For records of papers on Medical Entomology, see Review of Applied Entomology, Series B.

The titles occurring in the Entomological News are not listed.

10—Proceedings of the Entomological Society of Washington, D. C. **12**—Journal of Economic Entomology, Concord, N. H. **19**—Bulletin of the Brooklyn Entomological Society. **33**—Annales de la Societe Entomologique de Belgique, Brussels. **36**—Transactions of the Entomological Society of London. **38**—Redia, Firenze, Italy. **41**—Bulletin de la Societe Entomologique Suisse, Bern. **49**—Entomologische Mitteilungen, Berlin-Dahlem. **57**—Biologisches Zentralblatt, Leipzig. **59**—Journal of Agricultural Research, Washington, D. C. **61**—Proceedings of the California Academy of Sciences, San Francisco. **76**—Nature, London. **78**—Bulletin Biologique de la France et de la Belgique, Paris. **85**—The Journal of Experimental Zoology, Philadelphia. **96**—Physis. Revista de la Sociedad Argentina de Ciencias Naturales, Buenos Aires. **111**—Archiv fur Naturgeschichte, Berlin. **118**—Die Naturwissenschaften, Berlin. **128**—Zeitschrift fur Induktive Abstammungs- und Vererbungslehre, Leipzig. **129**—The Bulletin of the Hill Museum, Witley, Surrey, England.

GENERAL. **Bell, E. L.**—Collecting notes. **19,** xvi, 96-7. **Gifford, J. W.**—Bee-sting and eyesight. **76,** cviii, 370. **Hanna, G. D.**—Insects of the Priblof islands, Alaska. Introduction. **61,** xi, 153-5. **Sasscer, E. R.**—Important insects collected on imported nursery stock in 1920. **12,** xiv, 353-55. **Talbot, G.**—The Hill museum, Surrey, England. **129,** i, 1-15. **Van Duzee, E. P.**—Orthoptera, Neuroptera, Hemiptera and Lepidoptera from the Pribilof islands, Alaska. **61,** xi, 193-5.

ANATOMY, PHYSIOLOGY, ETC. **Butschli, O.**—Vorlesungen ueber vergleichende anatomie. III. Sinnesorgane und leuchtorgane. 643-931. Berlin. **Carpentier, F.**—Pterothorax et prothorax. Etude des segments thoraciques d'un orthoptere. **33,** lxi, 337-43. **Car-**

penter, G. D. H.—Experiments on the relative edibility of insects, with special reference to their coloration. **36,** 1921, 1-105. **Lenz, F.**—Alternative modifikationen bei schmetterlingen. **128,** xviii, 93-103. **Malloch, A.**—Metallic coloration of chrysalids. **76,** cviii, 302-3. **Middleton, W.**—Some suggested homologies between larvae and adults in sawflies. **10,** xxiii, 173-92. **Onslow, H.**—Metallic coloration of chrysalids. **76,** cviii, 366. **Rabaud, E.**—L'adaptation et l'instinct des Cassides. **78,** lv, 153-83. **Ruschkamp, P. F.**—Wheelers trophallaxis und ursprung der insektenstaaten. **57,** xli, 481-94. **Seiler, J.**—Geschlechtschromosomenuntersuchungen an Psychiden. **128,** xviii, 81-92. **Tanzer, E.**—Morphogenetische untersuchungen und beobachtungen an Culiciden-larven. **111,** 1921, A, 7, 136-82. **Terao, A.**—A preliminary note on the structure of Hancock's gland of Oecanthus. (Annot. Zool. Japon, x, 41-4.) **Zeleny, C.**—The direction and frequency of mutation in the bar-eye series of multiple allelomorphs of Drosophila. **85,** xxxiv, 203-33. Die ruckbildung der augen durch mutation bei Drosophila. **118,** xx, 648-50.

ARACHNIDA, ETC. Berlese, A.—Centuria quinta di Acari nuovi. **38,** xiv, 143-95.

NEUROPTERA. Ulmer, G.—Ueber einige Ephemeropteren-typen alterer autoren. **111,** 1921, A, 6, 228-67.

Watson, J. R.—New Thysanoptera from New York. **19,** xvi, 78-86.

HEMIPTERA. Doane, R. W.—The Stanford collection of Coccidae. **12,** xiv, 306. **Parshley, H. M.**—On the genus Microvelia. **19,** xvi, 87-93. **Pennington, M. S.**—Notas sobre Coreidos argentinos. **96,** v, 28-39.

Knight, H. H.—A new species of Bolteria (Miridae). **19,** xvi, 73-4.

LEPIDOPTERA. Engelhardt, G. P.—Foodplant of Luperina passer. **19,** xvi, 86-7. **Giacomelli, E.**—Sobre un caso de albinismo (?) en "Dione vanillae." (Nymphalidae.) **96,** v, 64-6. **Hering, M.**—Die geographische verbreitung der Libytheiden. **111,** 1921, A, 4, 248-96.

DIPTERA. Headlee, T. J.—The mosquitoes of New Jersey and their control. (New Jersey Agr. Exp. Sta., Bull. 348, 229 pp.) **Hoffman, W. A.**—An early record regarding bot flies. **12,** xiv, 374. **Peryassu, A. G.**—Os Anophelineos do Brasil. (Arch. Mus. Nac., Rio de Janeiro, xxiii, 9-104.) **Shannon, R. C.**—A reclassification of the subfamilies and genera of the North American Syrphidae. **19,** xvi, 65-72.

Alexander, C. P.—Dipterous insects of the family Tipulidae from the Pribilof islands, Alaska. **61,** xi, 183-4. **Cole, F. R.**—Diptera from

the Pribilof Islands, Alaska. **61,** xi, 169-77. **Felt, E. P.**—The number of antennal segments in gall midges and a new species. **19,** xvi, 93-6. **Johnson, C. W.**—New species of Diptera. (Occ. Pap. Boston Soc. Nat. Hist., v, 11-17.) **Malloch, J. R.**—Dipterous insects of the family Anthomyiidae from the Pribilof islands, Alaska. **61,** xi, 178-82. **Van Duzee, M. C.**—A new species of the dipterous family Dolichopodidae from the Pribilof islands, Alaska. **61,** xi, 167-8.

COLEOPTERA. Banninger, M.—Vierter beitrag zur kenntnis der Carabinae. **49,** x, 112-20 (cont.). **Craighead, F. C.**—Hopkins host-selection principle as related to certain cerambycid beetles. **59,** xxii, 189-220. **Kessel, F.**—Ueber die stellung der Passandridae im system. **111,** 1921, A, 6, 33-35. **Kleine, R.**—Ueber die stellung der Ulocerinae innerhalb der familie der Brenthidae. Bestimmungstabelle der gattung Estenorrhinus. **111,** 1921, A, 6, 268-74; 275-81. **Knisch, A.**—Hydrophiliden aus Matto Grosso. **111,** 1921, A, 6, 1-24. **Notman, H.**—Concerning species, with notes on Phytodecta affinis, and pallidus. **19,** xvi, 75-8. **d'Orchymont, A.**—Le genre Tropisternus. (Hydrophilidae.) **33,** lxi, 349-74. **Pic, M.**—Nouveautes diverses. (Melan. Exot.-Ent., xxxiv, 33 pp.) **Wehrli, E.**—Monographische bearbeitung der gattung Psodos, nach mikroskopischen untersuchungen. **41,** xiii, 143-75. **Weise, J.**—Amerikanische Hispinen. **111,** 1921, A, 5, 263-74.

Van Dyke, E. C.—Coleoptera from the Pribilof islands, Alaska. **61,** xi, 156-66.

HYMENOPTERA. Frers, A. G.—Notas himenopterologicas. **96,** v, 66-71. **Frison, T. H.**—Hymenopterous insects of the family Bremidae from the Priblof islands, Alaska. **61,** xi, 185-7.

Cockerell, T. D. A.—Some parasitic megachilid bees of the western U. S. The epeoline bees of the American museum Rocky Mountain expeditions. (Amer. Mus. Novitates, Nos. 21-23.) **MacGillivray, A. D.**—New saw-flies from the Pribilof islands, Alaska. **61,** xi, 188-92.

The December, 1921, ENTOMOLOGICAL NEWS was mailed at the Philadelphia Post Office, December 16, 1921.

EXCHANGES

This column is intended only for wants and exchanges, not for advertisements of goods for sale. Notices not exceeding three lines free to subscribers.

These notices are continued as long as our limited space will allow; the new ones are added at the end of the column, and only when necessary those at the top (being longest in) are discontinued.

I will collect insects of all orders in this vicinity for collectors and others. Some Lepidoptera already on hand.—Miss Louise Knobel, 417 West 2nd Ave., Hope, Arkansas.

Advertiser will collect insects for museums and experienced collectors in exchange for rare Coleoptera. E. Suenson, 9 Hankow Road, Shanghai, China.

Will collect Coleoptera, Lepidoptera, Hymenoptera, Diptera, etc., of the Chilean region. M. René Martin, chez M. Montané-Aguilar, Villa Alemana, Valparaiso, Chile.

Coleoptera. For exchange: Saperda populnea. Wanted: Other Cerambycidae. Ernest Baylis, 5011 Saul Street, Philadelphia, Pa.

Tropical Butterflies will be given in exchange for Terias nicippe, Vanessa antiopa, Euchloe sara or any aberrant forms of Lepidoptera. Hal Newcomb, 804 Elizabeth St., Pasadena, Calif.

I will collect material in any order, region Isthmus of Tehuantepec and C. A. Correspondence from persons needing material invited. J. J. White, Ocotlan de Morelos, Oaxaca, Mexico.

Wanted.—Diabrotica longicornis Say. from all parts of its range; also any N. A. species of this genus new to my collection. Liberal exchange. K. F. Chamberlain, Cornwall Bridge, Connecticut.

Wanted.—Elateridae from the Southern and Western States; Adelocera, Melanotus, and Cardiophorus especially desired. Liberal exchange in other Coleoptera, or for cash. Edward D. Quirsfeld, Hillsdale, New Jersey.

Halticini wanted in exchange for Coleoptera or insects of other orders.—L. G. Gentner, 213 Bailey St., East Lansing, Mich.

For Exchange—A large number of the living pupae of European Sphingidae for the living pupae of American butterflies and moths. I. C. Cheesman, Curator of Insects, Zoological Society of London, Regents Park, London, N. W., England.

Wanted—Species of Homoptera, Hemiptera and Orthoptera not represented in my collection in exchange for duplicate material of these orders from South Dakota. List of duplicates on application. H. C. Severin, South Dakota State College, Brookings, South Dakota.

The Entomologist's Monthly Magazine.—A journal devoted to general Entomology, started in 1864, and now edited by G. C. Champion, J. E. Collin, W. W. Fowler, R. W. Lloyd, G. T. Porritt and J. J. Walker.

It contains descriptions of new genera and species in all orders (British and foreign), life histories, reviews of new works, etc. Vol. LVII (VII of the 3d Series) was commenced in January, 1921. The subscription for the 12 numbers is 15 shillings per annum, post free, to be sent to R. W. Lloyd, I, 5, Albany, Piccadilly, London, W., England. For terms for advertisements apply to him also.

RECENT LITERATURE

FOR SALE BY

THE AMERICAN ENTOMOLOGICAL SOCIETY

1900 RACE STREET, PHILADELPHIA, PA.

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